

*Star Shower seen at Mauritius.* By C. Meldrum, Esq.

A great shower of meteors was observed in this colony on the night of the 27th November last. I had not myself the good fortune to see it, but it was seen by several other persons who have obligingly communicated their observations.

At the Observatory it is customary to watch, as far as possible, for meteors during the whole of November, but on the night in question the sky was nearly overcast. At 9.15 P.M. we had a shower of rain, and at 9.30, when the last observation of the instruments and the weather was taken for the night, nine-tenths of the sky were overcast, and the weather was gloomy. Looking out about midnight from a window facing the north, I observed that the visible part of the heavens was still overcast, but remarked that the clouds were unusually luminous, as if the Moon in her first or last quarter were shining behind them. This struck me particularly, and I waited some minutes in expectation of seeing a break in the clouds.

On the following day, I received a telegram from the Hon. Edward Newton, Colonial Secretary, announcing that he and Mr. C. Bruce, Rector of the Royal College, had counted from their residence, twelve miles off, and nearly 900 feet above the level of the sea, 678 meteors between 9.30 P.M. and 12.55 A.M.; and soon afterwards I ascertained that some other members of our Meteorological Society, as well as several other gentlemen, had also observed the shower, all from the same part of the island.

In place of attempting to summarise the accounts which have reached me, I think it preferable to give them in full, in the order in which they were received.

(1.) *Mr. Newton and Mr. Bruce's Observations.*

"About 9.30 on the evening of November 27, we observed an unusual frequency of shooting-stars. At 9.35 we began to keep regular count. We continued our observations till 12.55, at which time the frequency had greatly diminished, as will be seen from the following statement of the numbers seen in the intervals of time noted :

From 9.35	to	10.35	786
10.35	"	11.35	1160
11.35	"	12.10	454
12.10	"	12.35	193
12.35	"	12.55	85
Total			2678

"The approximate time of greatest intensity of the shower was from 11 to 11.30. About this time two meteors of extraordinary brilliancy were particularly noted—the first at 11.22, and the second at 11.44.

“The former of these started from the three stars in the tail of *Aries*, and the luminous orb vanished somewhat south of the Ecliptic. The train of this meteor was distinctly visible for four minutes. At the vanishing moment of the luminous point, it slowly wheeled from horizontal to vertical, and was seen for nearly two minutes vertical to the horizon.

“The latter, starting from a point at right angles to the three stars in the tail of *Aries* and the *Pleiades*, passed through the *Pleiades*, *Taurus*, and *Orion*, and vanished near *Sirius*. Its train was visible for more than a minute.

“Nearly all the meteors observed radiated from a point near *Aries*, nearly at right angles with the *Pleiades*, and shot either in the direction of the bright meteor of 11.44, or in a line through *Aries*, cutting the Ecliptic,—vanishing to southward.

“From 80 to 90 per cent of the meteors were followed by a soft broad train of light, visible for several seconds after the vanishing of the luminous point, of diameter at least equal to the luminous orb, and extending from 10 to 20 degrees. In the case of the two bright meteors above mentioned, the train of light extended over at least 40 degrees.

“During our observations, portions of the heavens were from time to time obscured by thin dark fleeting clouds, which at times obscured the starting and vanishing points.

“Between 10 and 11 we observed occasionally a pulsating coruscation, similar to the appearance of the *Aurora Australis*. Mr. Meldrum, however, informs us that the instruments at the Observatory gave no indication of a magnetic disturbance.

“In colour, the majority of meteors seemed to be equal in purity to the most colourless stars.

“Taking a point as above described as visible radiating point, the angle of the majority of meteors was about equal to that of the meteors, figured in Johnston’s *Astronomical Atlas*, seen in November 1866. A few, however, shot with extreme velocity towards the North; these had no trains of light. Other meteors shot parallel to the general direction close to the horizon. Although we discontinued our observations at 12.55, the shower was not over, and a few meteors were seen near the western horizon after this time.

“It must be observed that the point from which our observations were taken was obscured by trees in the direction of the western horizon.

“About the time of greatest intensity nine meteors were visible at the same moment.

“During the greater part of our observations, up to midnight, the radiation of three, four, or five meteors, was nearly synchronous.

“Towards the time of greatest intensity, one of the observers was absent for about 15 minutes, and it is probable that many meteors during this interval escaped observation.”

(2.) *Observations by Lieut.-Colonel O'Brien, Inspector-General of Police, and Mr. A. Brown.*

"At about 10 o'clock last night (27th Nov.) our attention was drawn to the number of falling stars. Going outside and standing back to back, Mr. A. Brown and myself in a short time counted no less than 110. This continued till near 11 P.M.; when we went out again, and in 5 minutes counted 118. Some of these meteors were very bright, having tails like comets. Their course was generally longer than that of the others, and they seemed nearer to the Earth. The course of the shower was almost invariably from north to south, and more meteors were visible towards the Southern hemisphere than in other quarters."

(3.) *Observations by the Hon. Robert Stein and Mr. A. C. Macpherson.*

"On the 27th November, about 10.15 P.M., on looking towards the N.E., we noticed several meteors falling; the *Pleiades*, *Hyades*, and *Orion*, being at that time about  $45^{\circ}$  to  $50^{\circ}$  above the horizon.

"On observing carefully, we found the meteors in great numbers coming from due north, very much on a level with the stars above mentioned, and rather farther to the north of the *Pleiades* than the distance between the *Pleiades* and *Hyades*.

"They came, not from a point, but as it were along a broad belt crossing the Sun's path nearly at right angles, appearing at times in the north, but often also at the zenith and towards the southern horizon, passing as it were parallel, some from N.E. to S.E., some from north to south, and some from N.W. to S.W.

"The number of meteors was so great, and they appeared so irregularly, sometimes towards the north, sometimes overhead, sometimes right or left of the zenith, and sometimes towards the southern horizon, that we could not keep count of them; but from 10.15 to 10.30 they appeared to be falling at about the rate of one in every second, sometimes singly, and sometimes in twos or threes at a time. The more distant ones showed only bright luminous points, but the nearer every few minutes showed trains and sparks like a rocket, varying from  $2^{\circ}$  or  $3^{\circ}$  to  $5^{\circ}$  or  $6^{\circ}$  in length, and seldom reaching a length of  $10^{\circ}$ .

"Our view to the S.W. was partly closed, but on changing position, so as to get a view of that quarter, I found the meteors falling there too, but it appeared to me during the short time I looked in that direction, towards 11 o'clock, as if fewer were falling there than I had observed to the eastward of South."

(4.) *Observations by Mr. W. H. Marsh, Assistant Colonial Secretary.*

"I observed the shooting-stars at first at 9 o'clock. The sky was cloudy, but in spaces that were occasionally left clear, the meteors could be seen going from north to south. About half an hour later, the sky was quite clear.

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"I counted 100 shooting-stars in less than 9 minutes. With the exception of one in *Andromeda*, which went in an easterly direction, they all went to the south. I continued observing till 10.30. The meteors were almost entirely confined to the western half of the sky, and by far the greater number were observed in *Aquarius* and in the neighbourhood of *Fomalhaut*. Most of them were very dim and small, but occasionally a bright one made its appearance. I observed a very bright one at about 10.15, which came from the direction of the zenith, and appeared to pass right through the star *Achernar*."

(5.) *Observations by Capt. Fry.*

"On the evening of the 27th November, my attention was drawn towards the heavens by seeing an immense number of stars of all magnitudes shooting towards the south from *Orion*, which was at the time about  $30^{\circ}$  above the eastern horizon, in a straight line through the zenith to about  $40^{\circ}$  above the western horizon, below which altitude clouds obscured the sky. The greater number seemed to move from the southern side of the above described line. They were all exceedingly bright, and varied in size from an ordinary meteor to *infinitely* small. The time was from 9 to 10.15 P.M., when clouds screened the view. I endeavoured to keep count, but could not, owing to the immense number, and the quickness of their movements. I am an old mariner and have often had opportunities of watching the heavens at night, but I never witnessed anything to compare to the sight on the night of the above date. On the 28th I made preparations to watch for a repetition of the spectacle, but not having seen more than is observed on an ordinary night, say four or five, I gave it up, and retired at 11 P.M."

(6.) *Observations by Capt. Gaston of Ship Penélope from Vahemar to Mauritius.*

"Le Mercredi, 27 Novembre, étant par une latitude de  $19^{\circ} 52'$  Sud et  $50^{\circ} 25'$  longitude Est, le temps était magnifique, mais calme. Vers  $7\frac{1}{2}$  h du soir une chose rare se montra au firmament; une quantité extraordinaire de météores parurent successivement, se formant dans le Nord, allant dans leur course vers le Sud-Est. Les uns donnaient une clarté très vive et d'autres ne laissaient qu'une légère trainée de feu ressemblant à des fusées; mais tous allaient avec une grande rapidité. Ce manège de petits météores dura jusque vers 2 heures du matin.

"Un autre fait non moins curieux s'était présenté dans la journée. Tous les marins connaissent l'Alcyon (ou hirondelle de mer), et tous savent que ces petits oiseaux se tiennent dans les eaux du navire, mais en petite quantité. Nous avons, pour ainsi dire, été assaillis par ces oiseaux, les uns voltigeant autour du

navire et les autres posés sur l'eau assez près les uns des autres  
ce qui ressemblait à une masse noire."

The above observations, with the exception of Captain Gaston's, were all taken within a circle of 3 miles in diameter, and at altitudes of 700 to 1000 feet.

There are, as might be expected, some discrepancies in the accounts given, but it appears that the meteors were seen in two streams, the one passing through *Aries*, *Pisces*, and *Aquarius*, nearly along the ecliptic, and the other through *Taurus*, across the ecliptic, and through *Orion* towards *Sirius*, while others passed the zenith from north to south.

The radiant point would appear to have been close to the stars  $\alpha$  and  $\zeta$  in the foot of *Perseus*, near the spot indicated by Mr. Newton and Mr. Bruce. Mr. Stein, however, probably from his seeing only a part of the sky, thinks there was no radiant point. I have not seen him, though, since I received his description; but from verbal explanations given by Mr. Bruce and Mr. Marsh, and from Captain Gaston's account, I think the meteors shot from the above-mentioned point. Mr. Bruce informs me that he observed a meteor pass from northward close to and parallel with  $\epsilon$  and  $\alpha$  *Tauri*, and Mr. Marsh mentions that he saw one pass from near the zenith right over *Fomalhaut*.

I think there must be some mistake in the statement that many meteors shot from *Orion* through the zenith to the western horizon.

With regard to the time of maximum intensity, it must have been at 11, or soon after.

The shower was evidently not equal in splendour to that of the 24th Nov., 1866.

Watch was kept up during the night of the 28th to 29th, but the few meteors seen did not radiate from any point.

The number of meteors seen from the 12th to the 15th was not greater than on ordinary nights.

On referring to Quételet's Catalogue I find mention of only three showers seen about the 27th Nov.; one on the 25th Nov (16th Tul. Cal.), 1602, a second on the 25th Nov., 1822, and a third on the 29th Nov., 1850.

While on the subject of meteors, I beg to send an account of an extraordinary one seen here by the Rev. Mr. Wright on the evening of the 7th Nov. last. Mr. Wright's description in several respects applies to the Moon, which was at the end of her first quarter, and in the part of the heavens indicated. Has any similar meteor been seen in former times? It was totally different in form and appearance from the great meteor of Nov. 27, 1862.

*Mauritius, 12th Dec., 1872.*



*Apparent Paths of 54 Shooting-Stars observed at Newcastle-on-Tyne, 1872, November 27th, 6<sup>h</sup> to 7<sup>h</sup> p.m.; with the Determination of their Radiant-Point. By Prof. A. S. Herschel, B.A., F.R.A.S.*

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Prof. Herschel, Apparent Paths of

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No.	Approximate G.M.T. h m s	Apparent Magnitude and Colour.	Duration. sec.	From $\alpha$ $\delta$ (+)	To $\alpha$ $\delta$ (+)	Direction,* as from nearest point to Mean Radiant. $\alpha$ $\delta$ (+)	Least Devia- tion from Mean Radiant Point. $\alpha$ $\delta$ (+)	Length of Path; Radiant Streak, and its Duration. sec.	Remarks.
1	6 2 0	1 br. wh.	1	338° 5	29° 5	1 14	..	20 none	Bright, swift. Unconformable.
2	2 30	3 wh.	0.6	349	22° 5	347 18	5	47 12 5	Erratic (from <i>Cassiopeia</i> ).
3	3 30	2 wh.	0.5	22° 5	35	22° 5	35	5 0	Almost stationary.
4	4 0	Sir. wh. or. r.	0.8	335	-1	327 -11	18	43 2 12 red; 3	{ Or. with r. sparks; strk. in mid course.
5	5 0	2	0.7	358	14	355 10	20	40 0 4	{ Three or four together, radiating from this place.
6+	6 0	2 and 3	..	near	21	32	..	short	{ Five others following it nearly on the same course.
7	7 0	> 1 wh. & r.	1.0	42	24	49 17	20	40 0 10 slight	{ Many bright ones, followed by a hull for one minute.
8	9 0	2 wh.	0.8	351	21	344° 5	20	40 0 9	{ Brightest in mid-course.
9	9 30	2	..	341° 5	8	335 -0° 5	18	41 2 10	{ Three meteors following each other on the same course.
10	10 30	Sir. wh. r.	..	86	55	100 53	20	40 0 8 { reddish, with spks	{ Golden yel. sparks in mid-course.
11	11 30	2 wh.	..	44	40° 5	55 36° 5	21	44 4 10	{ Quite a burst of many meteors.
12	12 0	3 yel.	..	347	16	343° 5	21	37° 5 2° 5 5	{ Many fine ones missed.
13	13 0	2 and 3 yel.	..	64	51° 5	73 51	23	34° 5 6 6	{ Erratic (from near $\alpha$ <i>Andromede</i> ).
14	13 30	Sir. wh. r.	0.9	265	83	232 72	32	40 8 12 or.; 3 s.	{ Two radial groups with it, near and diverging from $\theta$ <i>Cassiopeie</i> and $\phi$ <i>Persei</i> .
15	15 0	2 wh.	..	226	75	218 64	24	41 2° 5 11 none	{ Two others near it, as from $\beta$ <i>Andromede</i> .
16	18 0	2 wh.	..	342	65	324 69	16	38 4 8	{ Two close together, and parallel.
17	19 0	2 wh.	0.8	331	52° 5	309 44	27	51 12 15	
18	19 30	3 yel.	..	277	72	241 67	0	35 14 13 none	
19	20 0	3	..	269	57	264 55	16	37° 5 4 4	
20	20 15	2	..	277	54	269 51	15	36 5 5	
21	21 0	3 yel.	..	343	47	333 45	23	47 6° 5 6 none	
22	21 15	1	..	354	28	350 24	18	42 2° 5 5	
23	21 30	1	..	354	24	350 24	18	42 2° 5 5	
24	21 45	1	..	354	24	350 24	18	42 2° 5 5	

No.	Time	Lat.	Long.	Mag.	Dir.	Dist.	Remarks
29	24 30	2 wh.	..	0.7	344	14.5	338 10 22 35 5 7
30	25 0	3	..	0.8	1	49	351 46 15 51 11 5
31	26 0	2 yel.	..	0.8	0	29	352 18 15 44 5 10
32	26 15	2 or.	..	..	345	27	340.5 24 20 40 0 4
33	26 30	Sir. yel.	..	..	324	49	306 41 24 49 9 15 { 2 secs.; or. yel. } Streak interrupted in the middle.
34	27 0	2	..	..	354	24	348 18 20 40 0 9
35	27 0	> 1 yel. or.	0.8	..	349	70	304 76.5 21 40 0.5 12 2 secs. { Five or six meteors missed for each of the last eight or ten recorded.
36	28 0	3	..	..	17	88.5	195 86 15 40 3.5 5
37	28 30	1	..	..	331	56	308 49 27 51 11.5 15 { Followed instantly by one of 2nd mag. on the same course.
38	30 0	4 yel.	..	..	8	55	0 58 25 42.5 4.5 4
39	30 30	2	..	..	340	65	320 68 23 41 2 6
40	30 45	2	..	..	262	52	255 46.5 23 42 3 8
41	32 0	> 2 yel.	..	..	23	35	.. .. 23 35 5 0 Stationary at same point as No. 3.
42	34 0	2	..	..	11	30	4 19 20 40 0 12
43	35 0	2	0.6	..	21	39	21.5 + 39 20 39 1 0.5 Nearly stationary.
44	35 30	1 yel.	0.8	..	18	42.5	.. .. 18 42.5 3 0 none { Quite stationary; a fine display of bright meteors just now.
45	37 0	2 yel.	..	..	280	57.5	269 51 29 45 8 10 1 sec.
46	38 0	3	..	..	334	51	324 50.5 21 41 1 4
47	38 15	> 1	..	..	302	46	282 37 21 41 1 18 2 secs. { Followed by four others of 1 and 2 mags. in 15 sec.
48	38 45	1	..	..	322	45	314 43.5 19 38.5 1.5 5 1 sec.
49	39 0	2	..	..	309	44	294 39 18.5 1.5 12
50	40 0	3	..	..	313	41.5	304 39.5 16 34 6.5 7
51	40 30	2	..	..	295	44	278.5 38.5 14 34.5 6 15
52	43 0	2	..	..	300	53	292 51 18 39 1.5 5
53	45 0	> 1 wh. or.	0.8	..	319	54.5	302 48 28 49.5 10 12 streak { Much brighter in mid-course, and leaving a streak there.
54	55 0	1 yel.	0.7	..	338	10	330 3 22 35 5 9 none Clouds covering half the sky.
55	57 0	2 yel.	0.7	..	326	0.5	321 -6 16.5 44 4.5 8 none Afterwards quite overcast.
Average Duration (omitting No. 1)	0.75				Mean Radiant Point	..	20.0 4.2 8.0 Mean Deviation from Radiant, and Length of Path (omitting No. 1.)

\* Adopting, as a *provisional mean radiant*, a point in R.A.  $20^{\circ}$ , N. Decl.  $40^{\circ}$ . All the positions are taken from a star-chart for the epoch 1860.

† No. 6; a radial group almost simultaneous, diverging from a point between  $\beta$  *Andromedæ* and  $\alpha$  *Trianguli*.